

CLAIMS

What is claimed is:

1. An echo canceler circuit comprising:

an uplink data attenuator operative to receive at least post-echo canceler uplink data and uplink echo return loss based attenuation data and in response to attenuate the post-echo canceler uplink data to produce attenuated uplink data; and

an echo return loss (ERL) based attenuation data generator operatively coupled to the uplink data attenuator and operative to produce the uplink echo return loss based attenuation data in response to echo return loss data, wherein the echo return loss data is based on at least one of: attenuated downlink data, pre-echo canceler uplink data and amplifier gain data.
2. The echo canceler circuit of claim 1 wherein the echo return loss based attenuation data generator is operative to calculate the echo return loss data based on a ratio of the attenuated downlink data and the pre-echo canceler uplink data.
3. The echo canceler circuit of claim 1 wherein the uplink data attenuator is operative to attenuate the post-echo canceler uplink data over a period of time to produce the attenuated uplink data.
4. An echo canceler circuit comprising:

an uplink data attenuator operative to receive post-echo canceler uplink data and uplink echo return loss based attenuation data and in response to attenuate the post-echo canceler uplink data to produce attenuated uplink data;

a downlink data attenuator operative to receive downlink data and downlink echo return loss based attenuation data and in response to attenuate the downlink data to produce attenuated downlink data; and

an echo return loss based attenuation data generator operatively coupled to the uplink data attenuator and the downlink data attenuator and operative to produce the uplink echo return loss based attenuation data and the downlink echo return loss based attenuation data in response to instantaneous echo return loss data wherein the instantaneous echo return loss data is based on at least one of: attenuated downlink data, pre-echo canceler uplink data and amplifier gain data.

5. The echo canceler circuit of claim 4 wherein the echo return loss based attenuation data generator is operative to calculate the instantaneous echo return loss data based on a ratio of the attenuated downlink data and the pre-echo canceler uplink data and in response to produce the uplink echo return loss based attenuation data and the downlink echo return loss based attenuation data based on at least the instantaneous echo return loss data.

6. The echo canceler circuit of claim 5 wherein the echo return loss based attenuation data generator is operative to update standard echo return loss data based on the instantaneous echo return loss data when not in a double talk mode, such that at least one of the uplink echo return loss based attenuation data and the downlink echo return loss based attenuation data is based on the standard echo return loss data when the echo return loss based attenuation data generator determines that the standard echo return loss data indicates no problematic acoustic coupling channel.

7. The echo canceler circuit of claim 5 including:
a digital to analog converter operatively coupled to the downlink data attenuator, and operative to receive the attenuated downlink data and in response to produce a downlink audio signal;

an amplifier, operatively coupled to the digital to analog converter, and operative to receive the downlink audio signal and in response to produce an amplified downlink audio signal, wherein the amplifier has an amplifier gain;

a microphone operative to receive at least a portion of the amplified downlink audio signal and in response to produce a pre-echo canceler uplink signal; and

an analog to digital converter operatively coupled to the microphone, the uplink data attenuator and the echo return loss based attenuation generator and operative to receive the pre-echo canceler uplink signal and in response, to produce the pre-echo canceler uplink data wherein the echo return loss based attenuation data generator determines a change in the amplifier gain based on the instantaneous echo return loss data.

8. The echo canceler of claim 4 wherein the uplink data attenuator is operative to attenuate the post-echo canceler uplink data over a first period of time to produce the attenuated uplink data, and the downlink data attenuator is operative to attenuate the downlink data over a second period of time to produce the attenuated downlink data.

9. The echo canceler circuit of claim 5 wherein the echo return loss based attenuation data generator updates failsafe echo return loss data based on the instantaneous echo return loss data and updates standard echo return loss data based on the instantaneous echo return loss data when not in a double talk mode, wherein the echo return loss based attenuation data generator produces the uplink echo return loss based attenuation data and the downlink echo return loss based attenuation data based on (a) the standard echo return loss data when the echo return loss based attenuation data generator determines that at least one of: the standard echo return loss data and the failsafe echo return loss data indicates no problematic acoustic coupling channel, and (b) the failsafe echo return loss data when the echo return loss based attenuation data generator determines that at least one of: the standard echo return loss data and the failsafe echo return loss data indicates a problematic acoustic coupling channel.

10. A communication apparatus comprising:

a housing having coupled therewith:

an echo canceler circuit within the housing including:

an uplink data attenuator operative to receive at least post-echo canceler uplink data and uplink echo return loss based attenuation data and in response to attenuate the post-echo canceler uplink data to produce attenuated uplink data;

an echo return loss based attenuation data generator operatively coupled to the uplink data attenuator and operative to produce the uplink echo return loss based attenuation data in response to echo return loss data, wherein the echo return loss data is based on at least one of: attenuated downlink data, pre-echo canceler uplink data and amplifier gain data; and

a transceiver within the housing operatively coupled to the uplink data attenuator and operative to receive the attenuated uplink data and in response to transmit the attenuated uplink data.

11. The communication apparatus of claim 10 wherein the transceiver is at least one of: a wireless wide area network (WWAN) transceiver, a wireless local area network (WLAN) and a wireless device.

12. The communication apparatus of claim 10 wherein the communication apparatus includes at least one of: a speakerphone and a telephone.

13. The communication apparatus of claim 11 further including a location information generator operative to produce location information, wherein the echo canceller circuit includes:

one or more processing devices operatively coupled to the location information generator; and

memory containing instructions executable by the one or more processing devices to cause the one or more processing devices to provide the location information to the transceiver, wherein the transceiver transmits the location information.

14. The communication apparatus of claim 10 wherein the transceiver receives downlink audio data and in response provides the downlink audio data to the echo canceler circuit.

15. An in-vehicle communication system comprising:

an echo canceler circuit comprising:

an uplink data attenuator operative to receive at least post-echo canceler uplink data and uplink echo return loss based attenuation data and in response to attenuate the post-echo canceler uplink data to produce attenuated uplink data;

an echo return loss based attenuation data generator operatively coupled to the uplink data attenuator and operative to produce the uplink echo return loss based attenuation data in response to echo return loss data wherein the echo return loss data is based on at least one of: attenuated downlink data, pre-echo canceler uplink data and amplifier gain data;

a wireless transceiver operatively coupled to the uplink data attenuator and operative to receive the attenuated uplink data and in response to transmit the attenuated uplink data;

an audio system including:

an amplifier, operatively coupled to the echo canceler circuit, and operative to receive the attenuated downlink data and in response to produce an amplified downlink audio signal; and

a playback module including at least one of: a tuner module, a tape player, a CD player, a DVD player, operatively coupled to the amplifier and operative to provide at least a playback audio signal to the amplifier.

16. The in-vehicle communication system of claim 15 wherein the wireless transceiver is at least one of: a wireless wide area network (WWAN) transceiver, a wireless local area network (WLAN) transceiver and a wireless device.

17. The in-vehicle communication system of claim 15 wherein the echo return loss based attenuation data generator is operative to calculate the echo return loss data based on a ratio of the attenuated downlink data and the pre-echo canceler uplink data.

18. The in-vehicle communication system of claim 15 including at least one speaker, operatively coupled to the amplifier, and operative to receive the amplified downlink audio signal and in response to acoustically produce the amplified downlink audio signal.

19. The in-vehicle communication system of claim 15 further including a microphone operative to receive at least a portion of the amplified downlink audio signal and in response to produce the pre-echo canceler uplink signal.

20. The in-vehicle communication system of claim 15 wherein the uplink data attenuator is operative to attenuate the post-echo canceler uplink data over a period of time to produce the attenuated uplink data.

21. A method for attenuating echo data comprising:
producing uplink echo return loss based attenuation data in response to echo return loss data, wherein the echo return loss data is based on at least one of: attenuated downlink data, pre-echo canceler uplink data and amplifier gain data; and
attenuating post-echo canceler uplink data to produce attenuated uplink data in response to the uplink echo return loss based attenuation data.

22. The method of claim 21 including:

producing both downlink echo return loss based attenuation data and the uplink echo return loss based attenuation data in response to the echo return loss data wherein the echo return loss data is based on a ratio of the attenuated downlink data and pre-echo canceler uplink data; and

attenuating downlink data in response to the downlink echo return loss based attenuation data to produce the attenuated downlink data.

23. The method of claim 22 including:

detecting a double talk mode; and

attenuating the post-echo canceler uplink data and the downlink data in response to detecting the double talk mode and the echo return loss data.

24. The method of claim 21 wherein the post-echo canceler uplink data is attenuated over a period of time to produce the attenuated uplink data.

25. Memory containing instructions executable by one or more processing devices that causes the one or more processing devices to:

produce uplink echo return loss based attenuation data in response to echo return loss data, wherein the echo return loss data is based on at least one of: attenuated downlink data, pre-echo canceler uplink data and amplifier gain data; and

attenuate post-echo canceler uplink data to produce attenuated uplink data in response to the uplink echo return loss based attenuation data.

26. The memory of claim 25 containing executable instructions that cause the one or more processing devices to:

produce both downlink echo return loss based attenuation data and the uplink echo return loss based attenuation data in response to the echo return loss data wherein the

echo return loss data is based on a ratio of the attenuated downlink data and the pre-echo canceler uplink data; and

attenuate downlink data in response to the downlink echo return loss based attenuation data to produce the attenuated downlink data.